

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re Application of:

Tustin et al.

Serial No.: 10/650,510

Group Art Unit: 1755

Filed: August 28, 2003

Examiner: Patricia L. Hailey

For: FLUIDIZABLE CARBON CATALYSTS

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Commissioner for Patents

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**AMENDED APPEAL BRIEF**

This is an appeal from the final rejection of the Examiner dated July 19, 2006, rejecting claims 1-5, 6-8, and 13-15. This Brief is accompanied by the requisite fee set forth in 37 C.F.R. § 41.20(b)(2) and a Petition for Extension of Time under 37 C.F.R. 1.136 wherein Appellants request a 1 month extension of time for submitting this Brief.

**REAL PARTY IN INTEREST**

The real party in interest is Eastman Chemical Company.

**RELATED APPEALS AND INTERFERENCES**

Appellants are not aware of any prior or pending appeals, interferences, or judicial proceedings that may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

## **STATUS OF CLAIMS**

Claims 1–40 are pending in the application. Of these, claims 1–5, 6–8, and 13–15 stand rejected. The rejection of these claims is being appealed.

Claims 9–12 and 16–40 stand withdrawn as being directed to a non-elected invention.

A copy of the rejected claims is set out in Appendix A.

## **STATUS OF AMENDMENTS**

No amendments have been filed after final rejection.

## **SUMMARY OF CLAIMED SUBJECT MATTER**

There are three independent claims in the group of claims under appeal. Claims 1 and 6 are directed to a fluidizable catalysts and claim 13 is for a process for the preparation of fluidizable catalysts.

Claim 1 is directed to a fluidizable catalyst comprising carbonized polysulfonated vinylaromatic polymer particles in which the particles have an average particle diameter of about 1 to about 200 micrometers ( $\mu\text{m}$ ) (Page 3, lines 16–22; page 6, lines 10–25; page 7, lines 11–24; and page 10, line 21 through page 11, line 1).

Claim 6 is also directed to a fluidizable catalyst comprising carbonized, polysulfonated vinylaromatic polymer particles except that the catalyst also comprises at least one catalyst component selected from alkali metals, alkaline earth metals, metal oxides, metal hydroxides, halides, inorganic acids, and metals from Groups 4–12 of the Periodic Table of the Elements. In addition, the carbonized polymer particles have an average particle diameter of about 10 to about 130  $\mu\text{m}$ ; a BET surface area of

about 500 to about 1200 m<sup>2</sup>/g; and a pore volume ratio of about 0.7 to about 10 (Page 4, lines 3–10, and page 12, line 20 through page 13, line 15).

Claim 13 is for a process for the preparation of fluidizable catalysts by i) contacting vinylaromatic polymer particles having an average particle diameter of about 1 to about 200 µm with 30% oleum to produce a reaction mixture comprising polysulfonated vinylaromatic polymer particles; ii) washing the polysulfonated vinylaromatic polymer particles from step (i) with water; and iii) heating the polysulfonated vinylaromatic polymer particles from step (ii) at a temperature from about 600°C to about 1000°C (Page 16, lines 9–18).

#### **GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

The grounds of rejection presented for review are of claims 1–5 and 13–15 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,839,331 to Maroldo et al (US '331), of claims 6–8 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,452,043 to Zoeller et al (US '043) in view of U.S. Patent No. 4,839,331 to Maroldo et al; and of claims 6–8 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No 6,235,673 to Zoeller et al (US '673), also in view of U.S. Patent No. 4,839,331 to Maroldo et al.

#### **ARGUMENTS**

##### **Rejection of Claims 1–5 and 13–15 under 35 U.S.C. §103(a)**

The rejection of claims 1–5 and 13–15 should be overruled because there is no *prima facie* case of obviousness. In particular, US '331 fails to disclose or suggest carbonized polysulfonated vinylaromatic polymer particles, or a process to prepare such particles, in which the particles have an average particle diameter of about 1 to about 200 micrometers (µm).

In relevant part, US '331 discloses adsorbent particles prepared by partial pyrolysis of polysulfonated macroporous precursor resins (Col 1, lines 5–7). These resins are prepared from macroporous poly(vinylaromatic) resins (Col 3, lines 8–13). The particles may be further activated with reactive gases or by functionalization (Col 5, lines 36–62). In one example, US '331 discloses that the particle size of the starting resin before sulfonation is from 0.85 to 2.5 mm (850 to 2500  $\mu\text{m}$ ) (Col. 6, lines 41–45). However, US '331 does not mention or, in any way, suggest carbonized particles having an average particle size of 1 to about 200  $\mu\text{m}$ .

The Examiner acknowledges that US '331 fails to teach the claimed particle size range by stating that US '331 "is silent with respect to the particle size" (*Final Office Action* at 4). The Examiner then attempts to overcome this deficiency by asserting that the particles disclosed by US '331 must inherently possess the range of particle size as claimed by Appellants because of similarities between certain properties of the carbonized particles of US '331 and Appellants' invention such as, for example, pore volume ratio, surface area, and method of preparation.

This argument, however, falls short. The Examiner presents no objective data, extrinsic evidence, or technical reasoning that supports the assertion that the claimed particle size range is necessarily present in the particles disclosed in US '331, even though such a showing is required (see MPEP §2112 (IV)). The evidence, in fact, is to the contrary. The Examiner, for example, fails to consider Example 1 in US '331 which discloses that the particle size range of the starting resin before sulfonation is from 0.85 to 2.5 mm (850 to 2500  $\mu\text{m}$ ). This range is almost an order of magnitude larger than Appellants' claimed particle size range. Appellants have explained that sulfonation and pyrolysis would not be expected to materially change the particle size diameter. Clearly, the particles disclosed in US '331 could not inherently possess the much smaller, particle size range as claimed in Appellants' invention.

Notwithstanding the above, the Examiner also asserts that US '331 somehow teaches or suggests a range of particle sizes that encompasses an average particle size of 1 to about 200  $\mu\text{m}$ . This argument is based on the following passage from the '331 patent:

Although resin beads of the size produced by conventional suspension polymerization processes are a useful size for the further reactions and end uses, the process may be conducted on larger or smaller beads, and even on ground macroporous resins produced in non-bead form. For adsorbent and separative use, the resins may be further ground or selectively sieved to produce the desired particle size. (Col. 4, lines 49-56)

Appellants respectfully disagree with this assertion. The above disclosure does not point to any specific range of particle size that would encompass, much less teach or suggest, Appellants' particle size range. As stated in §2142 of the MPEP, "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). Here there is no such express or implied suggestion of a particle size range that would have included Appellants' claimed range. In fact, the above disclosure encompasses an infinite number of possible particle size ranges that would not have directed the skilled person to any specific range. The '331 disclosure, therefore, is ambiguous as to a specific particle size range and, by any reasonable interpretation, could not be considered an explicit or implied suggestion or teaching of Appellants' invention.

Because US '331 does not disclose or suggest an average particle size range of 1 to about 200  $\mu\text{m}$ , it fails to teach each feature of the claimed invention. The Examiner,

therefore, has not made a *prima facie* case of obviousness. The rejection under §103(a), therefore, lacks a proper basis and should be overruled.

**Rejection of Claims 6–8 under 35 U.S.C. §103(a) over US '043 in view of US '331**

Like claims 1–5 and 9–13, the rejection of claims 6–8 under 35 U.S.C. §103(a) should be overruled because there is no *prima facie* case of obviousness. Specifically, US '043, either alone or in combination with US '331, does not disclose a fluidizable catalyst comprising carbonized polysulfonated vinylaromatic polymer particles in which the particles have an average particle diameter of about 10 to about 130  $\mu\text{m}$ .

US '043 discloses a method for producing acetic acid, methyl acetate and mixtures thereof by the carbonylation of methanol or a methanol source using a catalyst having an active metal selected from Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, Pt, and Sn in which the active metal is supported on a carbonized polysulfonated divinylbenzene–styrenic copolymer resin (Col. 1, lines 12–18). As acknowledged by the Examiner, US '043 is silent with respect to the properties recited in the claims (*Final Office Action* at 6). Thus, the Examiner admits that the disclosure of US '043 fails to teach or suggest a fluidizable catalyst comprising carbonized, polysulfonated vinylaromatic polymer particles having an average particle diameter of about 10 to about 130  $\mu\text{m}$ .

The only particle size range mentioned in US '043 is for the commercially available AMBERSORB carbonaceous adsorbents (Col. 9, lines 9–12), which are disclosed as having a 20–50 mesh size (841  $\mu\text{m}$  to 297  $\mu\text{m}$ ). As discussed above, US '331 also fails to disclose an average particle size range of 10 to about 130  $\mu\text{m}$ . Thus, US '043, either alone or in any reasonable combination with US '331, does not disclose or suggest an average particle size range of about 10 to about 130  $\mu\text{m}$ . Because the cited references fail to teach each feature of the claimed invention, the Examiner has not made a *prima*

*facie* case of obviousness. The rejection under §103(a), therefore, lacks a proper basis and should be overruled.

**Rejection of Claims 6–8 under 35 U.S.C. §103(a) over US '673 in view of US '331**

Because the disclosure of US '673 is almost identical to that of US '043, identical arguments apply to the rejection of claims 6–8 under 35 U.S.C. §103(a) over this reference, either alone or in combination of US '331. Again, the rejection should be overruled because there is no *prima facie* case of obviousness. US '673, either alone or in combination with US '331, does not disclose a fluidizable catalyst comprising carbonized polysulfonated vinylaromatic polymer particles in which the particles have an average particle diameter of about 10 to about 130  $\mu\text{m}$ .

US '673 discloses a supported catalyst that comprises a catalytically effective amount of an active metal selected from Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, Pt, and Sn that is supported on a carbonized polysulfonated divinylbenzene–styrene copolymer resin. The catalyst is particularly useful for the carbonylation of methanol and its derivatives to produce acetic acid and acetates in a vapor–phase carbonylation process (Col 1, lines 9–14).

As with US '043, the Examiner acknowledges that US '673 is silent with respect to the properties recited in the claims and, therefore, admits that the disclosure of US '673 fails to teach or suggest a fluidizable catalyst comprising carbonized, polysulfonated vinylaromatic polymer particles having an average particle diameter of about 10 to about 130  $\mu\text{m}$  (*Final Office Action* at 7). Again, the only particle size range mentioned in Zoeller is for the commercially available AMBERSORB carbonaceous adsorbents (col. 9, lines 9–12), which are disclosed as having a 20–50 mesh size (841  $\mu\text{m}$  to 297  $\mu\text{m}$ ). As discussed above, US '331 also fails to disclose or suggest an average particle size range of about 10 to about 130  $\mu\text{m}$ . Thus, US '673, either alone

or in combination with US '331, does not disclose or suggest an average particle size range of about 10 to about 130  $\mu\text{m}$ . Because the cited references fail to teach each feature of the claimed invention, there can be no *prima facie* case of obviousness. The rejection under §103(a), therefore, lacks a proper basis and should be overruled.

### Secondary Considerations

Even if one assumes a *prima facie* case is made, Appellants' showing of unexpected results weigh in favor of patentability. Specifically, Comparative Example 1 on page 37 of the instant application shows that the claimed catalyst particles unexpectedly show improved fluidization properties when compared against Ambersorb 572 (particle size range of 297  $\mu\text{m}$  to 841  $\mu\text{m}$ ) as disclosed in US '043 and US '673. Better fluidization behavior, in turn, typically results in catalysts having better isothermal temperature profiles, greater fluidized bed dimensional stability, and lower gas space velocities to achieve fluidization. Appellants respectfully submit that when these results are properly considered, the alleged *prima facie* obviousness is overcome.

In view of the arguments set forth above, Appellants believe there is no proper basis for the rejection of claims 1–8 and 13–15 under 103(a) and request that the rejection be overruled.

Respectfully submitted,

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**APPENDIX A**  
**Appealed Claims**

1. A fluidizable catalyst comprising carbonized polysulfonated vinylaromatic polymer particles in which the particles have an average particle diameter of about 1 to about 200 micrometers ( $\mu\text{m}$ ).
2. The fluidizable catalyst as recited in claim 1 in which the particles are beads or spheres.
3. The fluidizable catalyst as recited in claim 2 in which the particles have an average particle diameter of about 5 to about 150  $\mu\text{m}$ .
4. The fluidizable catalyst as recited in claim 3 in which the particles have a BET surface area of about 100 to about 2000  $\text{m}^2/\text{g}$ .
5. The fluidizable catalyst as recited in claim 4 in which the particles have a BET surface area of about 300 to about 1500  $\text{m}^2/\text{g}$  and a pore volume ratio of about 0.5 to about 20.
6. A fluidizable catalyst comprising carbonized polysulfonated vinylaromatic polymer particles and at least one catalyst component selected from alkali metals, alkaline earth metals, metal oxides, metal hydroxides, halides, inorganic acids, and metals from Groups 4–12 of the Periodic Table of the Elements in which the particles have

an average particle diameter of about 10 to about 130  $\mu\text{m}$ ;  
a BET surface area of about 500 to about 1200  $\text{m}^2/\text{g}$ ; and  
a pore volume ratio of about 0.7 to about 10.

7. The fluidizable catalyst as recited in claim 6 in which the catalyst component comprises at least one compound selected from sodium hydroxide, sodium oxide, potassium hydroxide, cesium hydroxide, barium hydroxide, barium oxide, calcium hydroxide, calcium oxide, magnesium oxide, magnesium hydroxide, hydrochloric acid, phosphoric acid, phosphomolybdic acid, or sulfuric acid.

8. The fluidizable catalyst as recited in claim 6 in which the catalyst component is one or more metals from Groups 8–12 of the Periodic Table of the Elements.

13. A process for the preparation of a fluidizable catalyst comprising:

- contacting vinylaromatic polymer particles having an average particle diameter of about 1 to about 200  $\mu\text{m}$  in a reaction zone with 30% oleum under sulfonation conditions of time, temperature, and pressure to produce a reaction mixture comprising polysulfonated vinylaromatic polymer particles;
- washing the polysulfonated vinylaromatic polymer particles from step (i) with water; and
- heating the polysulfonated vinylaromatic polymer particles from step (ii) at a temperature from about 600°C to about 1000°C.

14. The process as recited in claim 13 further comprising:

- iv) contacting the polysulfonated vinylaromatic polymer particles from step (iii) with steam, oxygen, carbon dioxide, air, or ammonia at a temperature from about 700°C to about 1000°C.

15. The process as recited in claim 14 in which the vinylaromatic polymer particles of step i) have

- an average particle diameter of about 10 to about 130 µm;
- a BET surface area of about 500 to about 1200 m<sup>2</sup>/g; and
- a pore volume ratio of about 1.0 to about 8.

**APPENDIX B**  
**Evidence**

None.

**APPENDIX C**  
**Related Proceedings**

None.